

ENGINEER'S STICKER:				CONTRACTOR'S STICKER:			
0	As Built	VLS	RS	TRK	13-06-2022		
A	Approval	VLS	RS	TRK	03-11-2021		
تتقيح REV.	سبب الإصدار ISSUED FOR	بواسطة PREPARED	راجعها CHECKED	وافق عليها APPROVED	التاريخ DATE		
 رقم المشروع		المملكة العربية السعودية KINGDOM OF SAUDI ARABIA المؤسسة العامة لتحلية المياه المالحة SALINE WATER CONVERSION CORPORATION (SWCC) مشروع نقل مياه الجبيل الرياض - مشروع خزان الخرج JUBAIL - RIYADH WATER TRANSMISSION SYSTEM AL KHARJ RESERVOIR STATION					
ENGINEER							
 شركة الراشد للتجارة والمقاولات AL-RASHID TRADING & CONTRACTING CO. المقاول CONTRACTOR		Al-Rashid Trading & Contracting Co.					
		TANK CPS, TRANSFORMER RECTIFIER UNIT TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION					
		DOCUMENT NO:				Sheet	Rev.
		5 1 - Q D 0 0 - H - 4 3 1				1 of 21	0
SUB CONTRACTOR							

KINGDOM OF SAUDI ARABIA							Sheet : 2 of 23		
SALINE WATER CONVERSION CORPORATION							Document Number		
JUBAIL TO RIYADH WATER TRANSMISSION SYSTEM AL KHARJ RESERVOIR STATION									
Subject:		TANK CPS, TRANSFORMER RECTIFIER UNIT TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION					51-QD00-H-431		
Revision Index	First Issue	Rev.	A	0					
		Date	11.03.21	13.06.22					
CONTENTS 1. INTRODUCTION..... 3 2. PURPOSE..... 3 3. DEFINITIONS 4 4. ABBREVIATIONS..... 4 5. REFERENCE DOCUMENTS 5 6. TECHNICAL DATA SHEET..... 6 6.1. DATA SHEET FOR 2 CHANNEL, 50V/50A & 30V/30A (FOR TANK CPS) 6 7. CIRCUIT & GA DRAWING11 8. DATA SHEETS12									
Final Engineering			Contractor			Subcontractor			
			Al-Rashid Trading & Contracting Co.			Al Shaikh / BSS Technologies			

KINGDOM OF SAUDI ARABIA		Sheet : 3 of 23
SALINE WATER CONVERSION CORPORATION		Document Number
JUBAIL TO RIYADH WATER TRANSMISSION SYSTEM AL KHARJ RESERVOIR STATION		
Subject:	TANK CPS, TRANSFORMER RECTIFIER UNIT TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION	51-QD00-H-431

Revision Index	First Issue	Rev.	A	0					
		Date	11.03.21	13.06.22					

1. INTRODUCTION

Al Shaikh International Group for Cathodic Protection System Co. (Al Shaikh CP) / Bin Sari Specialized Technologies has been awarded the contract by M/s Al Rashid Trading & Contracting Co. to carry out cathodic protection works which includes site survey, cathodic protection design, engineering, material supply, installation supervision, testing and commissioning of station piping, tank bottom plates and tank internal cathodic protection system.

2. PURPOSE

This document outlines the material specification of Transformer rectifier units for permanent cathodic protection of tank bottom (external) and tank internal. The structures to be cathodically protected shall be as per the following.

Technical details of structure:

Sl#	Description	Quantity	Diameter (m)	TR Rating
1	Tank bottom CP system for TK-01	01	60	50V/50A
2	Tank internal CP system for TK-01			30V/30A

Table-1

Final Engineering	Contractor	Subcontractor
	Al-Rashid Trading & Contracting Co.	Al Shaikh / BSS Technologies

KINGDOM OF SAUDI ARABIA							Sheet : 4 of 23		
SALINE WATER CONVERSION CORPORATION							Document Number		
JUBAIL TO RIYADH WATER TRANSMISSION SYSTEM AL KHARJ RESERVOIR STATION									
Subject:		TANK CPS, TRANSFORMER RECTIFIER UNIT TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION					51-QD00-H-431		
Revision Index	First Issue	Rev.	A	0					
		Date	11.03.21	13.06.22					
3. DEFINITIONS COMPANY : Saline Water Conversion Corporation (SWCC) EPC CONTRACTOR : Al Rashid Trading & Contracting Co. CP CONTRACTOR : AL Shaikh International Group for Cathodic Protection (Al Shaikh CP) / BSS Technologies Throughout this document the following terminology is used, “shall” : The word “SHALL” is understood to be a mandatory to comply with the requirements “should” : The word “SHOULD” is understood to be a mandatory recommended to comply with the requirements “may” : Signifies a feature, which is discretionary in the context in which it is applied. 4. ABBREVIATIONS A : Ampere AC : Alternating Current CP : Cathodic Protection CVCC : Constant Voltage Constant Current DC : Direct Current HRC : High Rupturing Capacity Hz : Hertz MCCB : Moulded Case Circuit Breaker ONAN : Oil Natural Air Natural P.S.P : Pipe to Soil Potential RCB : Residual Circuit Breaker Ph : Phase SS : Stainless Steel SCR : Silicon Control Rectifier V : Volt W : Watt									
Final Engineering				Contractor			Subcontractor		
				Al-Rashid Trading & Contracting Co.			Al Shaikh / BSS Technologies		

KINGDOM OF SAUDI ARABIA							Sheet : 5 of 23		
SALINE WATER CONVERSION CORPORATION							Document Number		
JUBAIL TO RIYADH WATER TRANSMISSION SYSTEM AL KHARJ RESERVOIR STATION									
Subject:		TANK CPS, TRANSFORMER RECTIFIER UNIT TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION					51-QD00-H-431		
Revision Index	First Issue	Rev.	A	0					
		Date	11.03.21	13.06.22					
5. REFERENCE DOCUMENTS Cathodic protection system shall be designed in accordance with the requirements of the latest edition of following codes, standards and references. In case of contrasting requirements arising from the multiplicity of applicable documents, the following order of precedence shall apply: <u>Project documents</u> JK-DCPA-V4G02 Rev07 : Project specification G02 - Description of project and works pipe laying and station construction works QC10-H-096 Rev07 : Specification E16 – Cathodic protection JK-DCPA-M09 Rev0 : Steel tanks JK-DCPA-M21 Rev0 : Painting of Piping, Equipment and Structural Steel work 01-QB10-R-402 RevA : Design Criteria for Cathodic Protection System 49-QP10-S-303 RevA : Al-Kharj reservoir station general plot plan 49-YB70-S-301 RevA : General arrangement drawing of potable water storage tank (Dia. 60m x H-18.75m) <u>International standards</u> BS EN 12954:2019 : Cathodic protection of buried or immersed metallic structures – General principles and application. BS EN ISO 15589-1 : Petroleum, petrochemical and natural gas industries. Cathodic protection of pipeline systems. On-land pipelines BS EN 12499:2003 : Internal cathodic protection of metallic structures NACE SP 0388 : Impressed current cathodic protection of internal submerged carbon surface of steel water storage tank NACE SP 0575 : Internal cathodic protection (CP) systems in oil-treating vessels NEMA 250 : Enclosures for electrical equipment (1000 volts maximum)									
Final Engineering			Contractor			Subcontractor			
			Al-Rashid Trading & Contracting Co.			Al Shaikh / BSS Technologies			

KINGDOM OF SAUDI ARABIA		Sheet : 6 of 23
SALINE WATER CONVERSION CORPORATION		Document Number
JUBAIL TO RIYADH WATER TRANSMISSION SYSTEM AL KHARJ RESERVOIR STATION		
Subject:	TANK CPS, TRANSFORMER RECTIFIER UNIT TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION	51-QD00-H-431

Revision Index	First Issue	Rev.	A	0					
		Date	11.03.21	13.06.22					

API 651:2014 : Cathodic protection of above ground petroleum storage tanks

NFPA 70®:2011 : National Electrical Code

6. TECHNICAL DATA SHEET

6.1. Data Sheet for 2 Channel, 50V/50A & 30V/30A (For Tank CPS)

A.C. input voltage	400 V ± 10%, 3 Ph, 4 Wire, 60 Hz
A.C. Input Current	10 A (max.)
D.C. Power Output	Total = 3400 W Channel-1 = 2500 W Channel-2 = 900 W
Transformer	
Type	Double wound isolation
Over voltage capacity	20% continuous
KVA rating	5.9 KVA
Class	Class B
Dielectric strength	2.5 KV for 1 minute
Efficiency	> 95%
Regulation	3%
DC output voltage	Channel-1 = 0 to 50 V Channel-2 = 0 to 30 V
DC output current	Channel-1 = 0 to 50 A Channel-2 = 0 to 30 A
Factor of safety for diodes/SCRs	
Voltage	300% factor of safety
Current	300% factor of safety
Full load efficiency of rectifier	> 75%
Full load power factor	Not less than 0.8 lagging

Final Engineering	Contractor	Subcontractor
	Al-Rashid Trading & Contracting Co.	Al Shaikh / BSS Technologies

KINGDOM OF SAUDI ARABIA							Sheet : 7 of 23		
SALINE WATER CONVERSION CORPORATION							Document Number		
JUBAIL TO RIYADH WATER TRANSMISSION SYSTEM AL KHARJ RESERVOIR STATION									
Subject:		TANK CPS, TRANSFORMER RECTIFIER UNIT TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION					51-QD00-H-431		
Revision Index	First Issue	Rev.	A	0					
		Date	11.03.21	13.06.22					
	Insulation level				2 KV for 1 minute				
	Cable entry				From the side of the TR unit through suitable cable glands following cable entry are available a) AC input b) DC output c) Reference cells				
	Peak inverse voltage								
	Diode				1200 V				
	SCR				1200 V				
	Filtering circuit				L.C. filter				
	Ripple & Hum				< 5% RMS at rated output				
	Surge diverters for diodes/SCRs				Metal oxide varistors / Capacitors / R-C networks				
	Lightning arrestor				At both AC input & DC output side of the TR unit RMS voltage rating : 500V RMS current rating : 5KA Type : LT 0.5 or Eqv.				
	Protection				a) 3 pole MCCB in AC input b) HRC fuses in AC input c) MCB at DC output Glass cartridge fuses in the live line of all lamps and meter circuits Glass cartridge fuses in the live line of all auxiliary power lines to control circuit Fast acting electronic overcurrent limits circuit & short circuit protection for output.				
	Reference electrode				Facility for 3 nos. Cu/CuSO ₄ shall also be provided to select one out of three reference electrodes by means of a manually operated reference selector switch.				
Final Engineering			Contractor			Subcontractor			
			Al-Rashid Trading & Contracting Co.			Al Shaikh / BSS Technologies			

KINGDOM OF SAUDI ARABIA							Sheet : 8 of 23		
SALINE WATER CONVERSION CORPORATION							Document Number		
JUBAIL TO RIYADH WATER TRANSMISSION SYSTEM AL KHARJ RESERVOIR STATION									
Subject:		TANK CPS, TRANSFORMER RECTIFIER UNIT TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION					51-QD00-H-431		
Revision Index	First Issue	Rev.	A	0					
		Date	11.03.21	13.06.22					
		Control element			The DC output will be controlled using latest solid state SCRs. These SCRs will be controlled by the commands from the control circuits. All the electronic circuits will be assembled on plug-in type control cards.				
		Modes of operations			Following modes of control shall be provided a) Auto Ref. mode The operation of the unit in this mode will be fully automatic and will be controlled by the reference electrode feedback. The unit will automatically maintain reference voltage or pipe to soil potential within ±20mV of the set value under all conditions. b) CVCC mode This will be the second mode of operation. In this mode the unit can be operated in either constant voltage or constant current mode. In constant voltage mode the DC output voltage will be adjustable from 0 to rated values in step less manner by means of a voltage setter potentiometer. In constant current mode the DC output current will be adjustable from 0 to rated value in step less manner by means of a current setter potentiometer.				
		Remote monitoring			Following signals can be monitored through remote monitoring system a) TR unit output DC voltage b) TR unit output DC current c) TR unit AC voltage d) Instant Off Potential e) Cu/CuSO4 Reference Electrode				
Final Engineering			Contractor			Subcontractor			
			Al-Rashid Trading & Contracting Co.			Al Shaikh / BSS Technologies			

KINGDOM OF SAUDI ARABIA		Sheet : 9 of 23
SALINE WATER CONVERSION CORPORATION		Document Number
JUBAIL TO RIYADH WATER TRANSMISSION SYSTEM AL KHARJ RESERVOIR STATION		
Subject:	TANK CPS, TRANSFORMER RECTIFIER UNIT TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION	51-QD00-H-431

Revision Index	First Issue	Rev.	A	0					
		Date	11.03.21	13.06.22					

Reference fail safe feature	In the event of failure of the reference electrode, the DC output voltage of the unit will get to a preset value. This preset voltage is adjustable from 0 to rated voltage.
Reference (P.S.P) voltage setting range in auto reference mode	-0.8 V to -2.5 V
Reference regulation in auto mode	Better than ± 20 mV
Voltage setting range in CVCC mode	Channel-1 = 0 to 50 V Channel-2 = 0 to 30 V
DC voltage regulation in CVCC (manual) mode	Better than ± 0.5 V
Current setting range in auto mode & CVCC mode	Channel-1 = 0 to 50 A Channel-2 = 0 to 30 A
Current regulation in current limit	Better than ± 0.5 A
Indication / Annunciations	a) AC supply ON b) Under protection c) Over protection d) Reference fail e) Auto reference mode f) CVCC mode g) Current limit
Meters / instruments	72mm x 72mm analogue meters for the following: DC Voltage : 0 to 60 V DC for Channel-1 0 to 40 V DC for Channel-2 DC current : 0 to 60 A DC for Channel-1 0 to 40 A DC fir Channel-2 Provided with 75 mV external shunt 72mm x 72mm digital meter for the following P.S.P : 0 to ± 19.99 V DC Interrupter : 0.1s to 999 seconds

Final Engineering	Contractor	Subcontractor
	Al-Rashid Trading & Contracting Co.	Al Shaikh / BSS Technologies

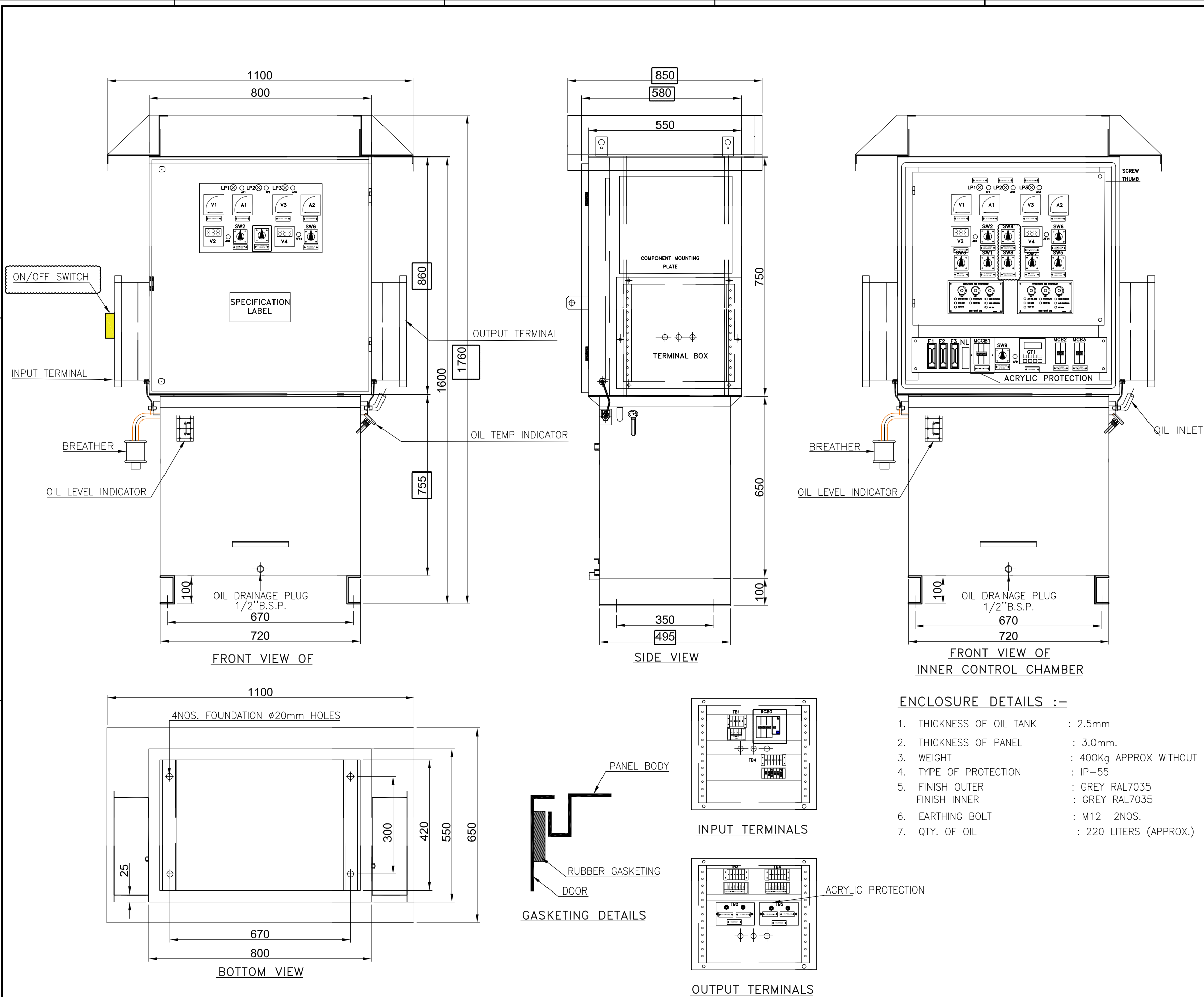
KINGDOM OF SAUDI ARABIA		Sheet : 10 of 23
SALINE WATER CONVERSION CORPORATION		Document Number
JUBAIL TO RIYADH WATER TRANSMISSION SYSTEM AL KHARJ RESERVOIR STATION		
Subject:	TANK CPS, TRANSFORMER RECTIFIER UNIT TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION	51-QD00-H-431

Revision Index	First Issue	Rev.	A	0					
		Date	11.03.21	13.06.22					

Current interruption	GPS current interruption facility will be provided by means of a built-in mercury relay & remote monitoring unit. 0.1 sec to 999 Hr. ON time & OFF time setting facility by digital key pad. Timer will have START & STOP facility through RS 485.
Cooling	Natural Oil Cooled (ONAN). Transformer oil to BS 148:1984 class 1 Quantity : 175 Liters
Enclosure / Construction	Floor mounted outdoor type arc resistance enclosure, fabricated from 2.5 mm steel sheet. Oil tank to be fabricated from 3mm steel sheet. Confirming to IP55 degree of protection.
Painting	Surface preparation by Shot Blast to SA 2.5. Polyamide epoxy : 150 microns Polyurethane top coat : 50 microns Total minimum DFT : 200 microns Finish color : RAL7035
Weight	300 kg (Approx.) without oil
Earthing	2 nos. M12 earthing bolt shall be provided
Environment	Ambient temperature : 0-55 degree C Humidity : 95% RH maximum
Accessories	a) Oil inlet with plug b) Oil level gauge c) Oil drain valve d) Oil temperature meter indicator e) Breather with silica gel f) Removable canopy g) Rating plate

Final Engineering	Contractor	Subcontractor
	Al-Rashid Trading & Contracting Co.	Al Shaikh / BSS Technologies

KINGDOM OF SAUDI ARABIA							Sheet : 11 of 23		
SALINE WATER CONVERSION CORPORATION							Document Number		
JUBAIL TO RIYADH WATER TRANSMISSION SYSTEM AL KHARJ RESERVOIR STATION									
Subject:		TANK CPS, TRANSFORMER RECTIFIER UNIT TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION					51-QD00-H-431		
Revision Index	First Issue	Rev.	A	0					
		Date	11.03.21	13.06.22					
7. CIRCUIT & GA DRAWING									
Final Engineering			Contractor			Subcontractor			
			Al-Rashid Trading & Contracting Co.			Al Shaikh / BSS Technologies			



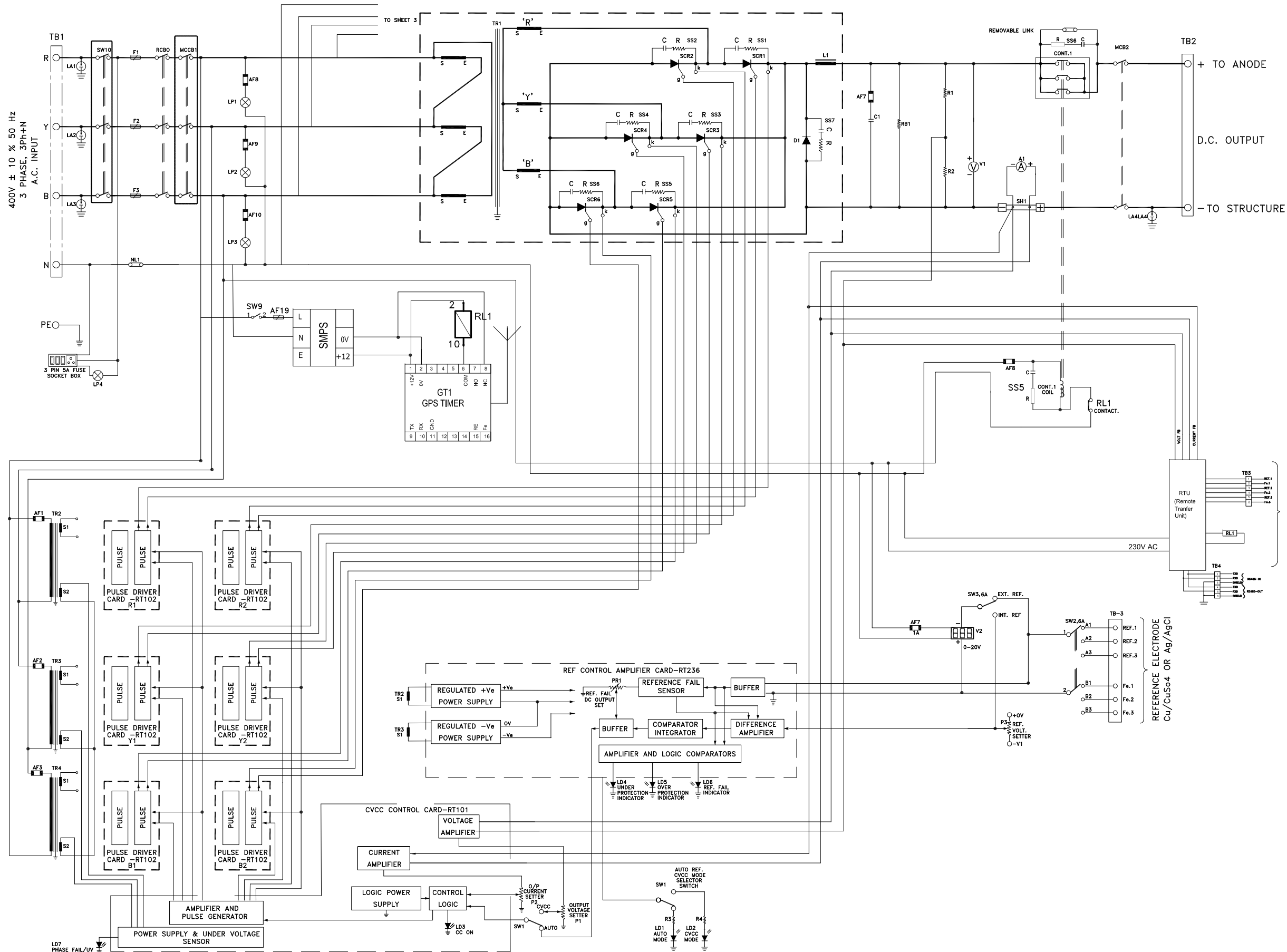
NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

LEGENDS:

LP1 MAINS ON INDICATOR LAMP FOR 'R' PHASE
LP2 MAINS ON INDICATOR LAMP FOR 'Y' PHASE
LP3 MAINS ON INDICATOR LAMP FOR 'B' PHASE
SW10 SWITCH FOR MAIN INPUT
MCCB MAIN INOUT MCCB
AF1-AF3 AUXILIARY FUSE FOR AC INPUT LAMPS
V1,V3 DC VOLT METER ANALOG FOR CH-1 & CH-2
A1,A2 DC AMMETER FOR CHANNEL 1 & CHANNEL 2
V2,V4 REFERENCE VOLT METER FOR CHANNEL 1 & CHANNEL 2
GT1 GPS TIMER FOR CHANNEL 1 & CHANNEL 2
SW9 INTERRUPTER BYPASS SWITCH
SW2,SW6 REFERENCE SELECTOR SWITCH
SW3,7 INTERNAL EXTERNAL REFERENCE ELECTRODE SELECTOR
SW1,5 AUTO/CVCC SELECTOR SWITCH FOR CHANNEL1&2
AF7,AF15 GLASS CARTRIDGE FUSE FOR DIGITAL METER
TB1 TERMINAL BLOCK FOR AC INPUT
TB2,TB5 TERMINAL BLOCK FOR DC OUTPUT
TB3,TB6 TERMINAL BLOCK FOR REFERENCE INPUT
TB4 TERMINAL BLOCK FOR REMOTE MONITORING
P1-P3 POTENTIOMETER,TYPE-RW3,2K,3W
P2-P4 POTENTIOMETER,TYPE-RW3,1K,3W
P5-P6 POTENTIOMETER,TYPE-RW3,500Ω,3W

REFERENCE DRAWING:		TITLE			
DRAWING NO.					
ENGINEER'S STAMP:		CONTRACTOR'S STAMP:			
0	AS BUILT	SKA	RS	TRK	13/06/2022
A	ISSUED FOR APPROVAL	SKA	RS	TRK	03/11/2021
رقم	من المصمم	تاريخ	رسم	رقم المراجعة	تاريخ
REV.	DESIGNED BY	DATE	DRAWING	REVISION	DATE
Project No: 205WCG00041					
					
المملكة العربية السعودية KINGDOM OF SAUDI ARABIA المؤسسة العامة لتحويل المياه المالحة SALINE WATER CONVERSION CORPORATION SWCC محطة نازح يوردم - خياورلا ليدجيا قادم لكون يوردم JUBAIL TO RIYADH WATER TRANSMISSION SYSTEM AL KHARJ RESERVOIR STATION					
مهندس ENGINEER					
 مقاول CONTRACTOR		شركة الراشد للتجارة والمقاولات AL-RASHID TRADING & CONTRACTING CO.			
مقاول خاص CP CONTRACTOR		AL HAIKH A CATHODIC PROTECTION COMPANY BssTech			
مقياس SCALE		TANK CPS, TRANSFORMER RECTIFIER UNIT TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION			
NTS		DRAWING NO. SHEET REV.			
		051-QD00-H-043112 OF 230			
مقاول خاص CP CONTRACTOR		BSST-DR-CPJ20206A-1-008			

G.A DIAGRAM FOR MANUAL C.P RECTIFIER UNIT FOR CATHODIC PROTECTION
(OUTDOOR INSTALLATION TYPE) RATING:-50V/50A & 30V/30A – DUAL CHANNEL



CIRCUIT DIAGRAM FOR AUTOMATIC CONTROLLED T/R UNIT FOR CATHODIC PROTECTION
(OUTDOOR INSTALLATION TYPE) CHANNEL-1 RATING:-50V/50A

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

LEGENDS:

LP1,2,3 MAINS ON INDICATOR LAMPS
LP4 PANEL ILLUMINATION LAMP
F1-F3 FUSES IN AC INPUT
SW10 SWITCH FOR AC INPUT ON/OFF
RCBO FOR AC INPUT
NL1 NEUTRAL LINK IN AC INPUT
MCCB1 MAINS ON/OFF MCCB
AF4 GLASS CARTRIDGE FUSE FOR DIGITAL VOLTMETER
AF1,2,3 GLASS CARTRIDGE FUSES FOR LAMPS
AF8 AUXILIARY FUSE FOR CONTACTOR COIL
AF19 AUXILIARY FUSE FOR SMPS1
AF9 GLASS CARTRIDGE FUSE FOR INTERRUPTER BYPASS
AF4-AF6 GLASS FUSES FOR AUX TRANSFORMERS
AF7 GLASS CARTRIDGE FUSE FOR REFERENCE METER
LA1-4 LIGHTNING ARRESTERS
TR1 MAIN TRANSFORMER
TR2-4 AUX. TRANSFORMERS
L1 D.C. FILTER CHOKE
V1 D.C. OUTPUT VOLTMETER
V2 REF. (P.S.P.) VOLTMETER
A1 D.C. OUTPUT AMMETER
SH1 SHUNT FOR D.C. AMMETER
RL1 RELAY FOR INTERRUPTION
CONT1 AIR BREAK CONTACTOR
P1 OUTPUT VOLTAGE SETTER POTENTIOMETER
P2 CURRENT LIMIT SETTER POTENTIOMETER
P3 REF. POTENTIAL SETTER POTENTIOMETER
SCR1-6 SILICON CONTROLLED RECTIFIER
D1 DIODE
SS1-7 SURGE SUPPRESSOR
RB1 RESISTOR BLEEDER
C1 CAPACITOR
LD1 AUTO REFERENCE MODE INDICATOR LED
LD2 CVCC MODE INDICATOR LED
LD3 CURRENT CONTROL ON LED
LD4 UNDER PROTECTION INDICATOR LED
LD5 OVER PROTECTION INDICATOR LED
LD6 REFERENCE FAIL INDICATOR LED
LD7 PHASE FAIL / UV INDICATOR LED
SW1 AUTO/MANUAL (CVCC) MODE SELECTOR SWITCH
SW2 REFERENCE ELECTRODE SELECTOR SWITCH
SW3 INTERNAL / EXTERNAL REF SELECTOR SWITCH
SW4 REMOTE/LOCAL SELECTOR SWITCH
RT101 CVCC CONTROL CARD
RT236 REF. CONTROL AMPLIFIER CARD
RT102 PULSE DRIVER CARD
TB1 TERMINAL BLOCK FOR AC INPUT
TB2 TERMINAL BLOCK FOR DC OUTPUT
TB3 TERMINAL BLOCK FOR REFERENCE INPUT
TB4 TERMINAL BLOCK FOR REMOTE MONITORING

REFERENCE DRAWINGS:

DRAWING NO.	TITLE

ENGINEER'S STAMP:	CONTRACTOR'S STAMP:

0	AS BUILT	SKA	RS	TRK	13/06/2022
A	ISSUED FOR APPROVAL	SKA	RS	TRK	03/11/2021
REV.	REVISION	DATE	DATE	DATE	DATE

Project No. 20SWCG00041	المملكة العربية السعودية KINGDOM OF SAUDI ARABIA الهيئة العامة للغذاء والدواء SALINE WATER CONVERSION CORPORATION SWCC جرجان نازخ عودهم - خياوردا ليدجيا قادم لوت عودهم JUBAIL TO RIYADH WATER TRANSMISSION SYSTEM AL KHARJ RESERVOIR STATION
----------------------------	--

ENGINEER	
----------	--

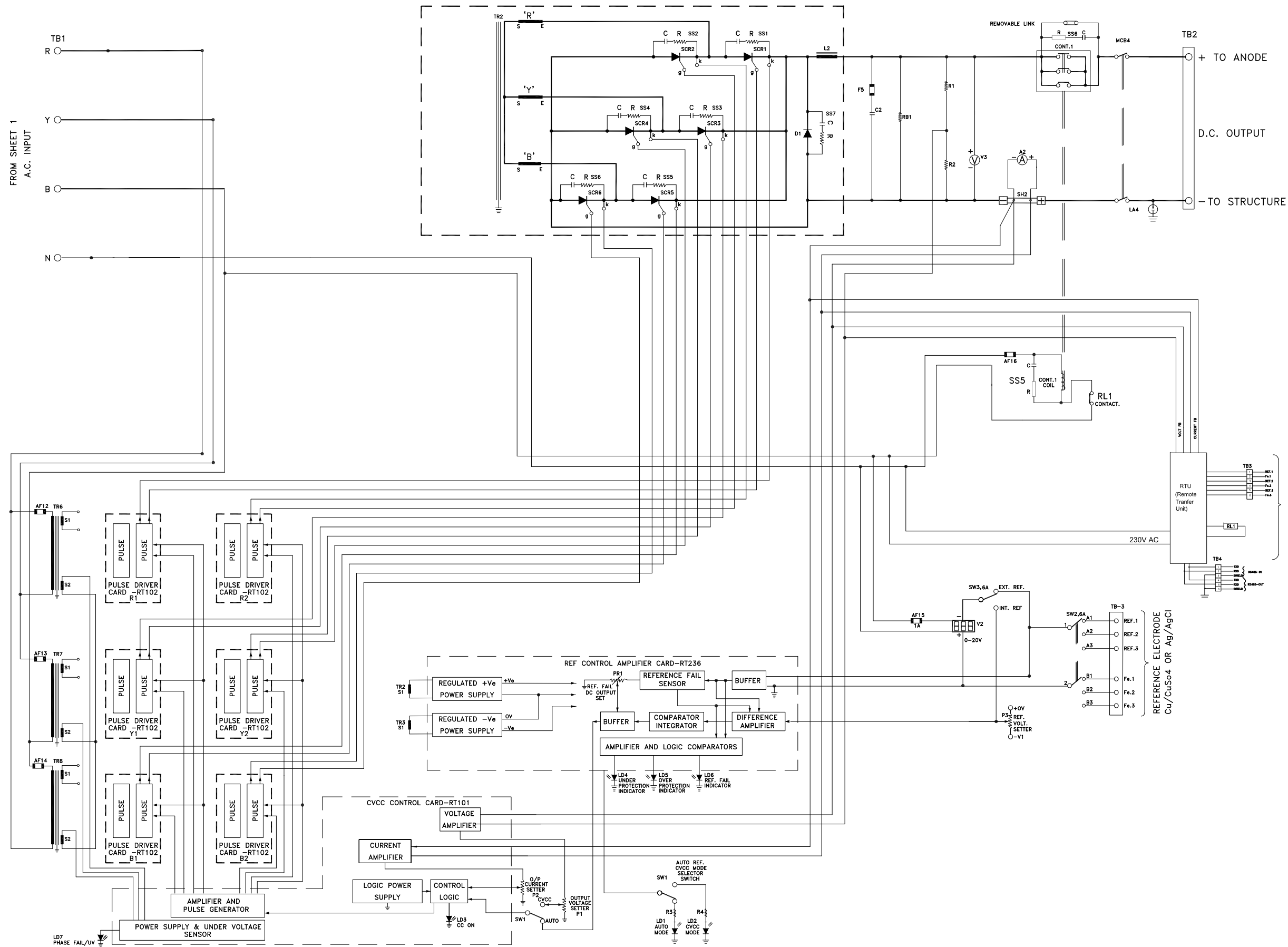
CONTRACTOR	شركة الراشد للتجارة والمقاولات RTCC AL-RASHID TRADING & CONTRACTING CO.
------------	--

CP CONTRACTOR	AL HAIKH BssTech SPECIALIZED IN CORROSION CONTROL & CATHODIC PROTECTION
---------------	--

SCALE	TANK CPS, TRANSFORMER RECTIFIER UNIT TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION
-------	---

NTS	DRAWING NO. 0511-QD00-H-043113 OF 23
-----	---

CP CONTRACTOR	BSST-DR-CPJ20206A-1-008
---------------	-------------------------



CIRCUIT DIAGRAM FOR AUTOMATIC CONTROLLED T/R UNIT FOR CATHODIC PROTECTION
(OUTDOOR INSTALLATION TYPE) CHANNEL-2 RATING:-30V/30A

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

LEGENDS:

LP4	PANEL ILLUMINATION LAMP
AF15	GLASS CARTRIDGE FUSE FOR DIGITAL VOLTMETER
AF12-14	GLASS CARTRIDGE FUSES FOR AUX. TRANSFORMERS
AF9	GLASS CARTRIDGE FUSE FOR INTERRUPTER BYPASS
AF1-3	GLASS FUSES FOR MAINS ON INDICATOR LAMPS
F5	HRC FUSE FOR CAPACITOR C2
LA5	LIGHTNING ARRESTERS
TR2	MAIN TRANSFORMER
TR6-8	AUX. TRANSFORMERS
L2	D.C. FILTER CHOKE
V3	D.C. OUTPUT VOLTMETER
V4	REF. (P.S.P.) VOLTMETER
A2	D.C. OUTPUT AMMETER
SH2	SHUNT FOR D.C. AMMETER
RL3	RELAY FOR INTERRUPTION
CONT1	AIR BREAK CONTACTOR
P1	OUTPUT VOLTAGE SETTER POTENTIOMETER
P2	CURRENT LIMIT SETTER POTENTIOMETER
P3	REF. POTENTIAL SETTER POTENTIOMETER
SCR1-6	SILICON CONTROLLED RECTIFIER
D1	DIODE
SS1-7	SURGE SUPPRESSOR
RB2	RESISTOR BLEEDER
C2	CAPACITOR
LD1	AUTO REFERENCE MODE INDICATOR LED
LD2	CVCC MODE INDICATOR LED
LD3	CURRENT CONTROL ON LED
LD4	UNDER PROTECTION INDICATOR LED
LD5	OVER PROTECTION INDICATOR LED
LD6	REFERENCE FAIL INDICATOR LED
LD7	PHASE FAIL / UV INDICATOR LED
SW5	AUTO/MANUAL (CVCC) MODE SELECTOR SWITCH
SW6	REFERENCE ELECTRODE SELECTOR SWITCH
SW7	INTERNAL / EXTERNAL REF SELECTOR SWITCH
SW8	REMOTE/LOCAL SELECTOR SWITCH
RT101	CVCC CONTROL CARD
RT236	REF. CONTROL AMPLIFIER CARD
RT102	PULSE DRIVER CARD
TB5	TERMINAL BLOCK FOR DC OUTPUT
TB6	TERMINAL BLOCK FOR REFERENCE INPUT
TB4	TERMINAL BLOCK FOR REMOTE COMMUNICATION

REFERENCE DRAWINGS:

DRAWING NO.	TITLE

ENGINEER'S STAMP:	CONTRACTOR'S STAMP:

0	AS BUILT	SKA	RS	TRK	13/06/2022
A	ISSUED FOR APPROVAL	SKA	RS	TRK	03/11/2021
REV.	REVISION	BY	CHECKED	APPROVED	DATE

Project No. 20SWCG00041	المملكة العربية السعودية KINGDOM OF SAUDI ARABIA الهيئة العامة للغذاء والدواء SALINE WATER CONVERSION CORPORATION SWCC مركزنا نازح عودنهم - ضاحية الدمام JUBAIL TO RIYADH WATER TRANSMISSION SYSTEM AL KHARJ RESERVOIR STATION
----------------------------	---

ENGINEER	
----------	--

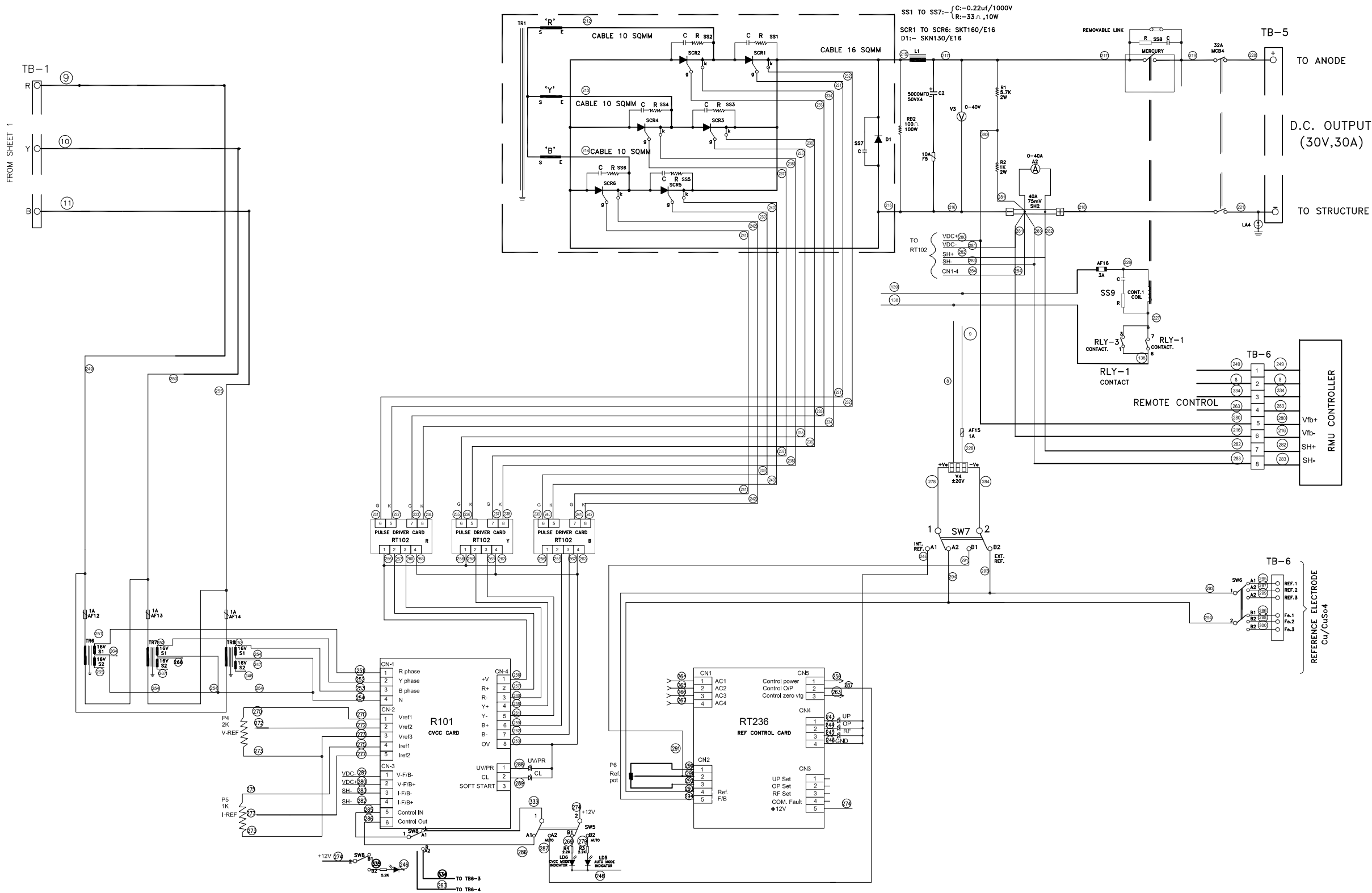
CONTRACTOR	شركة الراشد للتجارة والمقاولات RTCC AL-RASHID TRADING & CONTRACTING CO.
------------	--

CP CONTRACTOR	AL HAIKH BssTech SPECIALIZED IN CORROSION CONTROL & CATHODIC PROTECTION
---------------	--

SCALE	TANK CPS, TRANSFORMER RECTIFIER UNIT TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION
NTS	

DRAWING NO.	SHEET	REV.
051-QD00-H-0431	14	OF 23

CP CONTRACTOR	BSST-DR-CPJ20206A-1-008
---------------	-------------------------



WIRING DIAGRAM FOR AUTOMATIC CONTROLLED T/R UNIT FOR CATHODIC PROTECTION
(OUTDOOR INSTALLATION TYPE) CHANNEL-2 RATING:-30V/30A

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

LEGENDS:

LP4	PANEL ILLUMINATION LAMP
AF15	GLASS CARTRIDGE FUSE FOR DIGITAL VOLTMETER
AF12-14	GLASS CARTRIDGE FUSES FOR AUX. TRANSFORMERS
AF9	GLASS CARTRIDGE FUSE FOR INTERRUPTER BYPASS
AF1-3	GLASS FUSES FOR MAINS ON INDICATOR LAMPS
F5	HRC FUSE FOR CAPACITOR C2
LA5	LIGHTNING ARRESTERS
TR2	MAIN TRANSFORMER
TR6-8	AUX. TRANSFORMERS
L2	D.C. FILTER CHOKE
V3	D.C. OUTPUT VOLTMETER
V4	REF. (P.S.P.) VOLTMETER
A2	D.C. OUTPUT AMMETER
SH2	SHUNT FOR D.C. AMMETER
RL3	RELAY FOR INTERRUPTION
CONT1	AIR BREAK CONTACTOR
P1	OUTPUT VOLTAGE SETTER POTENTIOMETER
P2	CURRENT LIMIT SETTER POTENTIOMETER
P3	REF. POTENTIAL SETTER POTENTIOMETER
SCR1-6	SILICON CONTROLLED RECTIFIER
D1	DIODE
SS1-7	SURGE SUPPRESSOR
RB2	RESISTOR BLEEDER
C2	CAPACITOR
LD1	AUTO REFERENCE MODE INDICATOR LED
LD2	CVCC MODE INDICATOR LED
LD3	CURRENT CONTROL ON LED
LD4	UNDER PROTECTION INDICATOR LED
LD5	OVER PROTECTION INDICATOR LED
LD6	REFERENCE FAIL INDICATOR LED
LD7	PHASE FAIL / UV INDICATOR LED
SW5	AUTO/MANUAL (CVCC) MODE SELECTOR SWITCH
SW6	REFERENCE ELECTRODE SELECTOR SWITCH
SW7	INTERNAL / EXTERNAL REF SELECTOR SWITCH
SW8	REMOTE/LOCAL SELECTOR SWITCH
RT101	CVCC CONTROL CARD
RT236	REF. CONTROL AMPLIFIER CARD
RT102	PULSE DRIVER CARD
TB5	TERMINAL BLOCK FOR DC OUTPUT
TB6	TERMINAL BLOCK FOR REFERENCE INPUT
TB4	TERMINAL BLOCK FOR REMOTE COMMUNICATION .

REFERENCE DRAWINGS:

DRAWING NO.	TITLE

ENGINEER'S STAMP:

CONTRACTOR'S STAMP:

REV.	DESCRIPTION	DATE
0	AS BUILT	13/06/2022
A	ISSUED FOR APPROVAL	03/11/2021

Project No: 20SWCG00041	المملكة العربية السعودية KINGDOM OF SAUDI ARABIA الهيئة العامة للغذاء والدواء SALINE WATER CONVERSION CORPORATION SWCC جرجان نازح يورديم - خبارولدا ليريدجيا قاروم لوت عورديم JUBAIL TO RIYADH WATER TRANSMISSION SYSTEM AL KHARJ RESERVOIR STATION
----------------------------	--

ENGINEER

CONTRACTOR

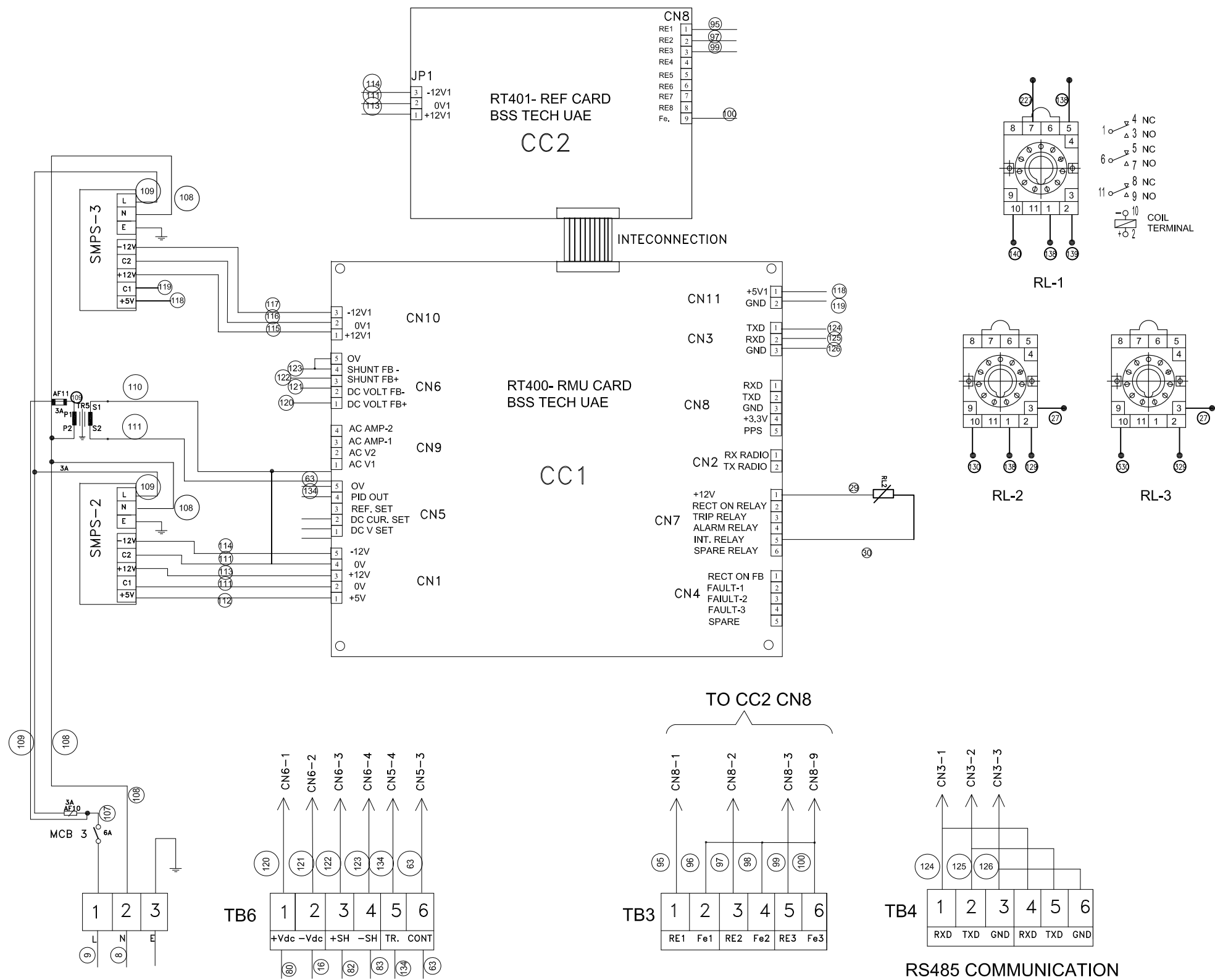
شركة الراشد للتجارة والمقاولات
RTCC AL-RASHID TRADING & CONTRACTING CO.

CP CONTRACTOR
AL-HAIKH BSS Tech
SPECIALIZED IN CORROSION CONTROL & CATHODIC PROTECTION

SCALE
NTS
TANK CPS, TRANSFORMER RECTIFIER UNIT
TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION

DRAWING NO.	SHEET	REV.
0511-QD00-H-0431	16	230

CP CONTRACTOR
BSST-DR-CPJ20206A-1-008



RMCS DIAGRAM FOR AUTOMATIC CONTROLLED T/R UNIT FOR CATHODIC PROTECTION
(OUTDOOR INSTALLATION TYPE) CHANNEL-1 RATING:-50V/50A

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

LEGENDS:

CC2 RMCS REFERENCE CONTROL CARD
CC1 RMCS PROCESSOR CARD
SMPS1 DC POWER SUPPLY FOR RMCS
SMPS2 DC POWER SUPPLY FOR RMCS
RLY1-2 12 VOLT DC RELAYS
TB3 REFERENCE ELECTRODE TERMINALS
TB4 TERMINALS FOR COMMUNICATION
TR9 AUX. TRANSFORMER FOR RMCS CARD
RL1-3 RELAY
AF11 GLASS FUSE FOR AUX. TRANSFORMER

DRAWING NO.	TITLE

ENGINEER'S STAMP:	CONTRACTOR'S STAMP:

REV.	DESCRIPTION	DATE
0	AS BUILT	13/06/2022
A	ISSUED FOR APPROVAL	03/11/2021

Project No. 20SWCG00041	المملكة العربية السعودية KINGDOM OF SAUDI ARABIA الهيئة العامة للغذاء والدواء SALINE WATER CONVERSION CORPORATION SWCC جرجان نازح عورثيم - خياوردا ليديجيا قائم لوق عورثيم JUBAIL TO RIYADH WATER TRANSMISSION SYSTEM AL KHARJ RESERVOIR STATION
----------------------------	---

ENGINEER	
----------	--

CONTRACTOR	RTCC	شركة الراشد للتجارة والمقاولات AL-RASHID TRADING & CONTRACTING CO.
------------	------	---

CP CONTRACTOR	AL HAIKH	BssTech	SPECIALIZED IN CORROSION CONTROL & CATHODIC PROTECTION
---------------	----------	---------	--

 SCALE	TANK CPS, TRANSFORMER RECTIFIER UNIT TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION																	
NTS	DRAWING NO.												SHEET		REV.			
	0	5	1	-	Q	D	0	0	-	H	-	0	4	3	1	17	OF	23

CP CONTRACTOR	BSST-DR-CPJ20206A-1-008
---------------	-------------------------

KINGDOM OF SAUDI ARABIA							Sheet : 19 of 23	
SALINE WATER CONVERSION CORPORATION							Document Number	
JUBAIL TO RIYADH WATER TRANSMISSION SYSTEM AL KHARJ RESERVOIR STATION								
Subject:		TANK CPS, TRANSFORMER RECTIFIER UNIT TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION					51-QD00-H-431	
Revision Index	First Issue	Rev.	A	0				
		Date	11.03.21	13.06.22				
8. DATA SHEETS <u>Transformer Oil</u> <i>As per the following product catalogue.</i>								
Final Engineering			Contractor			Subcontractor		
			Al-Rashid Trading & Contracting Co.			Al Shaikh / BSS Technologies		

PRODUCT INFORMATION

DESCRIPTION

National Transformer Oils are developed from Napthenic Base Oils having excellent Electrical properties to meet British Standards and related specifications for Electrical Insulating Oil.

PERFORMANCE LEVELS

Meets

International Electro Technical Commission Standard - IEC 60296 (2003) - Uninhibited

FEATURES

- ◆ Ensures good insulation of Electrical Conductors
- ◆ Prevents arcing between Electrodes
- ◆ Minimizes dielectric loss
- ◆ Effectively cools Transformer Coils
- ◆ Provides long service life
- ◆ Very high oxidation stability and outstanding reliability during prolonged service.

APPLICATIONS

Recommended for Electrical Insulating Oil applications such as Transformers & Oil immersed switchgear where an oil meeting BSI, IEC or other comparable specification is required by the equipment manufacturer or user.

TYPICAL CHARACTERISTICS

Property	Test Method	Limits	Typical Values
<u>1. FUNCTION:</u>			
1 Viscosity, mm ² /sec			
@ 40°C	ISO 3104	Max 12.0	8.50
@ -30°C	ISO 3104	Max 1800	300
2 Pour Point, °C	ISO 3016	Max -40	-45
3 Water Content, mg/Kg	IEC 60814	Max 30	15
4 Break down voltage, kV	IEC 60156	Min. 30	65
5 Density, g/ml @ 20 °C	ISO 3675	Max. 0.895	0.863
Density, g/ml @ 29.5 °C			0.858
6 DDF at 90 °C	IEC 60247	Max. 0.005	0.0005
<u>2. REFINING/ STABILITY</u>			
1 Appearance	-	Clear, free from sediments and suspended matter.	Clear, free from sediments and Suspended matter.

The above figures are typical figures with normal production tolerance.

PDS/Rev03/01

PRODUCT INFORMATION

TYPICAL CHARACTERISTICS

Property	Test Method	Limits	Typical
2 Acidity, mg KOH/g	IEC 62021-1	Max. 0.01	0.0012
3 Interfacial Tension, mN/m	ISO 6295	No general requirement	46
4 Total Sulphur Content	BS 2000 Part 373 or ISO 14596	No general requirement	-
5 Corrosive Sulphur	DIN 51353	Not-Corrosive	Not-Corrosive
6 Antioxidant Additives	IEC 60666	Not detectable	Not detectable
7 2-Furfural content	IEC 61198	Max. 0.1 mg/kg	Nil

3. PERFORMANCE:

1 Oxidation Stability	IEC-61125 (Method C) Test Duration: (U) Uninhibited Oil: 164 h		
a) Total acidity, mg KOH/gm		Max. 1.2	0.54
b) Sludge, %		Max. 0.8	0.21
c) DDF at 90 °C	IEC 60247	Max. 0.5	0.06
2 Gassing	IEC 60628, A	No general requirement	-

4. HEALTH, SAFETY and ENVIRONMENT:

1 Flash Point, °C	ISO 2719	Min. 135	148
2 PCA Content	BS 2000 Part 346	Max. 3.0	0.25
3 PCB Content	IEC 61619	Not detectable	Not detectable

HANDLING, HEALTH AND SAFETY

Lubricant consisting of highly refined mineral oils with specific additives. In normal conditions of use this lubricant presents no particular toxic hazard. All lubricants, of any kind should be handled with great care, particularly avoiding any contact with the skin.

Prevent any splashing and keep away from combustible materials. Store under cover and away from any risk of pollution. Disposes off the used oil correctly, don't pour down drains, into watercourses or the soil.

The above figures are typical figures with normal production tolerance.

KINGDOM OF SAUDI ARABIA		Sheet : 22 of 23
SALINE WATER CONVERSION CORPORATION		Document Number
JUBAIL TO RIYADH WATER TRANSMISSION SYSTEM AL KHARJ RESERVOIR STATION		
Subject:	TANK CPS, TRANSFORMER RECTIFIER UNIT TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION	51-QD00-H-431

Revision Index	First Issue	Rev.	A	0					
		Date	11.03.21	13.06.22					

Central Monitoring System

The central monitoring system will monitor and control all process parameters of cathodic protection system. All analog and digital signals from the transformer rectifier unit will be terminated to RMU panel for real time data logging at user programmable schedule. The RMU will have built-in fiber optic modem to communicate with the central station through RS485 over fiber optic communication network.

The central monitoring system can be programmed to detect and record anomalous input information i.e., input which falls outside of user programmable range. The alarms generated by transformer rectifier unit are used for generating a call in response to the user.

PC software should be able to monitor and receive data from up to 50 field RTU at a time.

The RMU software will perform following functions.

- Monitoring of signals as per user defined rate.
- Monitoring of alarms as per user defined rate.
- RMU software shall generate chart, table graphs & maintain database.
- The RMU software shall have graphical display capability for easy operation.

The central monitoring system software is user friendly and configurable with windows supported software.

RMS-Input Channel Configuration of Single Bullet (for Channel-1 : 50V/50A TR)

No.	Description	Typical Signal	Range	Total No. of Signals
1	TR unit output DC voltage	Monitoring	0 - 60V	01
2	TR unit output DC current	Monitoring	0 - 60A	01
3	TR Unit AC voltage	Monitoring	0 - 500V	01
4	Instant Off Potential	Monitoring	ON / OFF	01
5	Cu/CuSO ₄ Reference Electrode	Monitoring	0 ± 5V	02

Final Engineering	Contractor	Subcontractor
	Al-Rashid Trading & Contracting Co.	Al Shaikh / BSS Technologies

KINGDOM OF SAUDI ARABIA		Sheet : 23 of 23
SALINE WATER CONVERSION CORPORATION		Document Number
JUBAIL TO RIYADH WATER TRANSMISSION SYSTEM AL KHARJ RESERVOIR STATION		
Subject:	TANK CPS, TRANSFORMER RECTIFIER UNIT TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION	51-QD00-H-431

Revision Index	First Issue	Rev.	A	0					
		Date	11.03.21	13.06.22					

RMS-Input Channel Configuration of Single Bullet (for Channel-2 : 30V/30A TR)

No.	Description	Typical Signal	Range	Total No. of Signals
1	TR unit output DC voltage	Monitoring	0 - 40V	01
2	TR unit output DC current	Monitoring	0 - 40A	01
3	TR Unit AC voltage	Monitoring	0 - 500V	01
4	Instant Off Potential	Monitoring	ON / OFF	01
5	Cu/CuSO ₄ Reference Electrode	Monitoring	0 ± 5V	02

Final Engineering	Contractor	Subcontractor
	Al-Rashid Trading & Contracting Co.	Al Shaikh / BSS Technologies